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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/500,515	06/30/2004	Raphael Ihringer	16924-2	4367
53450 7590 03/27/2009 KRIEG DEVAULT LLP ONE INDIANA SQUARE SUITE 2800 INDIANAPOLIS, IN 46204-2079				
EXAMINER				
CANTELMO, GREGG				
ART UNIT		PAPER NUMBER		
1795				
MAIL DATE		DELIVERY MODE		
03/27/2009		PAPER		

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

### Office Action Summary

**Application No.**

10/500,515

**Applicant(s)**

IHRINGER ET AL.

**Examiner**

Gregg Cantelmo

**Art Unit**

1795

**Period for Reply** -- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 05 January 2009.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 25-56 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 25-56 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/CI/CDC)
- Paper No(s)/Mail Date 2/26/09
- 4) ☐ Interview Summary (PTO-413)
- Paper No(s)/Mail Date \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_

**DETAILED ACTION**

***Response to Amendment***

1. In response to the amendment received January 5, 2009:
  - a. Claims 25-56 are pending;
  - b. The previous claim objection and 112 rejection have been overcome in light of the amendment.

***Information Disclosure Statement***

2. The information disclosure statement filed February 26, 2009 has been placed in the application file and the information referred to therein has been considered as to the merits. The Gut reference "Anode supported PEN for SOFC" has only been considered in part, since a full copy of this reference has not been furnished. Notably the final page, page S-5 ends with an incomplete sentence and is absent any list of citations noted within pages S1 through S-5 in the reference. This reference appears to be materially significant to the claimed invention as evidenced by the application of this reference in the prior art rejections below. Applicant is urged to submit a complete copy of the reference for full consideration.

***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 25, 47 and 51 are rejected under 35 U.S.C. 102(b) as being anticipated by Gauckler et al. "Anode supported PEN for SOFC" (hereafter referred to as Gauckler).

Fig. 1 of Gauckler discloses an anode supported PEN design comprising a positive electrode, electrolyte and negative electrode assembly. The anode comprising 3 distinct continuous layers forming a single continuous structure. The layers comprising an interconnect layer which is a functional equivalent to the anode collector layer, an anode support layer, and an intermediate layer between the anode support layer and the electrolyte which is the functional equivalent to the active anode layer. An electrolyte layer is disposed between the cathode and anode. The interconnect covers the rear face of the anode support layer and the anode support layer comprises raised structures which form gas circulation channels with the anode collecting layer (or interconnecting plate, as applied to claim 25).

The anode is nickel on a YSZ ceramic (page 2, final paragraph as applied to claim 47).

The cathode material is LSM, LSC or lanthanum ferrocobaltates (page 2, final paragraph as applied to claim 51).

4. Claim 25 is rejected under 35 U.S.C. 102(b) as being anticipated by Gut et al. "Anode supported PEN for SOFC" (hereafter referred to as Gut).

Fig. 1 of Gut discloses an anode supported PEN design comprising a positive electrode, electrolyte and negative electrode assembly. The anode comprising 3 distinct continuous layers forming a single continuous structure. The layers comprising an interconnect layer which is a functional equivalent to the anode collector layer, an

anode support layer, and an intermediate layer between the anode support layer and the electrolyte which is the functional equivalent to the active anode layer. An electrolyte layer is disposed between the cathode and anode. The interconnect covers the rear face of the anode support layer and the anode support layer comprises raised structures which form gas circulation channels with the anode collecting layer (or interconnecting plate, as applied to claim 25).

***Claim Rejections - 35 USC § 103***

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

5. Claims 42-43, 45 and 52-53 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gauckler as applied to claim 25 above, and further in view of JP 02-239568 (JP '568).

The differences between claims 42, 43 and 45 and Gauckler are that Gauckler does not teach of the anode support layer comprising ceramic fibers or metal fibers (claim 42) in a proportion from 20-40% by volume (claim 43) or wherein the fibers have a diameter between particular ranges microns and the L/d ratio is between particular ranges (claims 45 and 52-53).

JP '568 discloses a solid oxide fuel cell wherein the fuel electrode (anode) includes ceramic fibers (abstract as applied to claim 42) and wherein the fibers have a diameter of 2-5 microns and a length of 10-30 microns (L/d ratio of 5 more as applied to claim 45). The ceramic can be present in an amount from 10-50% (see abstract and prior art claim 2 as applied to claims 43 and 52-53).

The motivation for employing the fuel electrode material of JP '568 is that it restricts or reduces deterioration of cell characteristics.

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Gauckler by employing the fuel electrode material of JP '568 is since it would have restricted or reduced deterioration of cell characteristics. The selection of a known material based on its suitability for its intended use supported a prima facie obviousness determination in *Sinclair & Carroll Co. v. Interchemical Corp.*, 325 U.S. 327, 65 USPQ 297 (1945) See also *In re Leshin*, 227 F.2d 197, 125 USPQ 416 (CCPA 1960). MPEP § 2144.07. Regarding the claimed diameters and L/d relationship: Generally, differences in ranges will not support the patentability of subject matter encompassed by the prior art unless there is evidence indicating such ranges are critical. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955). *In re Hoeschele*, 406 F.2d 1403, 160 USPQ 809 (CCPA 1969).

6. Claim 44 and is rejected under 35 U.S.C. 103(a) as being unpatentable over Gauckler as applied to claim 25 above, and further in view of JP 01-197971 (JP '971).

The difference is that Gauckler does not teach of the cathode support layer comprising ceramic fibers.

JP '971 discloses a solid oxide fuel cell wherein the various layers, including the cathode can include ceramic fibers therein (abstract).

The motivation for employing ceramic fibers in the cathode is to improve the mechanical characteristics of the cathode and fuel cell.

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings Gauckler by including ceramic fibers in the cathode material of as taught by JP '971 since it would have improved the mechanical characteristics of the cathode and fuel cell.. The selection of a known material based on its suitability for its intended use supported a prima facie obviousness determination in *Sinclair & Carroll Co. v. Interchemical Corp.*, 325 U.S. 327, 65 USPQ 297 (1945). See also *In re Leshin*, 227 F.2d 197, 125 USPQ 416 (CCPA 1960). MPEP § 2144.07.

7. Claim 46 and 54-55 and is rejected under 35 U.S.C. 103(a) as being unpatentable over Gauckler in view of JP '971 as applied to claim 44 above, and further in view of JP 01-197971 (JP '971).

The differences not yet discussed is of the fibers have a diameter between particular ranges each having an L/d ratio in a particular range.

JP '568 discloses a solid oxide fuel cell wherein an electrode (anode) includes ceramic fibers (abstract as applied to claim 42) and wherein the fibers have a diameter of 2-5 microns and a length of 10-30 microns (L/d ratio of 5 more as applied to claim 45). The ceramic can be present in an amount from 10-50% (see abstract and prior art claim 2 as applied to claims 46 and 54-55).

While the fibers are disposed in the fuel electrode, the combination of teachings of JP '971 and JP '568 would reasonably suggest dimensioning the ceramic fibers of JP '971, used in the various electrode and electrolyte layers of JP '971 to similar dimensions as that recited in JP '568 with a reasonable expectation that those

dimensions would have provided the requisite enhanced mechanical properties provided by the inclusion of ceramic fibers in a given layer of a solid oxide fuel cell.

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Gauckler and JP '971 by dimensioning the fibers of JP '971 in the manner suggested by JP '568 since it would have provided the predictable result of providing the requisite enhanced mechanical properties provided by the inclusion of ceramic fibers in a given layer of a solid oxide fuel cell. Generally, differences in ranges will not support the patentability of subject matter encompassed by the prior art unless there is evidence indicating such ranges is critical. In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). In re Aller, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955). In re Hoeschele, 406 F.2d 1403, 160 USPQ 809 (CCPA 1969). Regarding the claimed diameters and L/d relationship: Generally, differences in ranges will not support the patentability of subject matter encompassed by the prior art unless there is evidence indicating such ranges are critical. In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). In re Aller, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955). In re Hoeschele, 406 F.2d 1403, 160 USPQ 809 (CCPA 1969).

8. Claims 47 and 48 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gauckler as applied to claim 25 above, and further in view of U.S. Patent No. 6,214,485 (Barnett).

The differences are that Gauckler does not teach of the internal reforming arrangement of claim 47 or of the amount of reforming catalyst (claim 48).



Barnett teaches of a direct hydrocarbon reforming fuel cell wherein the anode includes nickel on a ceramic material (YSZ). In a preferred example the nickel reforming catalyst is in an amount of 10% relative to the anode (Example 11) which is a combination which has reduced carbon formation on the catalyst material at higher operating temperatures.

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Gauckler by configuring the anode to be a ceramic-supported nickel catalyst with an amount of catalyst of 10-20% since it would have provided improved direct reforming of a hydrocarbon in the fuel cell and provided an anode that can function at higher operating temperatures without carbon forming on the catalyst material.

***Allowable Subject Matter***

9. Claims 26-41, 49-50 and 56 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Regarding claims 26-29 and 49, none of the prior art of record are held to reasonably teach, suggest or render obvious the invention therein wherein the cathode also has, on its rear face which is designed to come into contact with an interconnecting plate-O), a raised structure which is chosen so as to form gas circulation channels with said interconnecting plate, and in that the raised structures of the anode and of the cathode each comprise a plurality of prominent bumps which are spaced apart from one another, wherein summit surfaces of the bumps of the anode are substantially coplanar

and parallel to the-summit surfaces of the bumps of the cathode, the latter likewise being coplanar with one another (claim 26). Claims 27-29 and 49 are dependent upon claim 26 and allowable for at least the same reasons.

Regarding claims 30-41 none of the prior art of record are held to reasonably teach, suggest or render obvious the invention therein wherein the front face of the anode on the electrolyte side also has a raised structure.

Regarding claims 50 and 56 none of the prior art of record are held to reasonably teach, suggest or render obvious the invention therein, wherein the front face of the anode on the electrolyte side also comprises raised structures wherein the raised structures of the front faces and/or rear faces of the anode and cathode.

While Hsu, of record shows an anode front face having a raised structure, this arrangement is one manner by which reactant may flow through the electrode. There is no apparent motivation to modify the teachings of Gauckler with that of Hsu to provide reactant flow paths since Gauckler already has channels for flowing reactant therein. Thus it would require a significant reconfiguration of Gauckler to provide the reactant flow channels to the front side and by doing so would not require the flow channels along the backside of the electrode as shown by Gauckler. Such a modification, would not have readily appreciated having both the raised structure of claim 25 in combination with the bumps of claim 26, or the raised structure of claim 25 in combination with the further raised structure of claim 30 or the raised structure of claim 25 in combination with the further raised structure of claims 50 and 56. Alternatively Hsu itself does not teach, reasonably suggest or render obvious the configuration of claims 26-41, 49-50 or

56 since Hsu does not teach of the collector layer and interconnect configuration as recited in claim 25 and even if Hsu were combined with Gauckler, the combination would still fail to reasonably suggest or obviate the invention of claims 26-41, 49-50 and 56 since the combination does not reasonably teach or suggest the raised structure of claim 25 in combination with the bumps of claim 26, or the raised structure of claim 25 in combination with the further raised structure of claim 30 or the raised structure of claim 25 in combination with the further raised structure of claims 50 or 56.

Therefore it would appear that claims 26-41, 49-50 and 56 appear novel over the prior art of record.

### ***Response to Arguments***

Applicant's arguments with respect to claims 25-56 have been considered but are moot in view of the new ground(s) of rejection.

### ***Conclusion***

Applicant's submission of an information disclosure statement under 37 CFR 1.97(c) with the fee set forth in 37 CFR 1.17(p) on February 26, 2009 prompted the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 609.04(b). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the

shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Gregg Cantelmo whose telephone number is 571-272-1283. The examiner can normally be reached on Monday to Thursday, 8:30-6:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Pat Ryan can be reached on 571-272-1292. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Gregg Cantelmo/  
Primary Examiner, Art Unit 1795